

Rip-Stop Reinforced Thin Film Sun Shield Structure, Phase I

Completed Technology Project (2012 - 2012)



Project Introduction

During a proposed Phase I and Phase II program, PSI will advance the TRL from 3 to 6 for the ripstop reinforcement of thin film membranes used for large deployable multi-layer structures in support of sunshades for passive thermal control and planet finding external occulters. The nanofiber based ripstop reinforcement will enhance membrane tear resistance providing protection against membrane damage during deployment or after micro-meteorite impact. Earlier ripstop research work performed under the NASA CETDP yielded a 50X increase in CP-1 membrane tear resistance and a mass increase of less than 5% for a 0.3 mil film. This low mass technology will provide these tear resistance gains while packaged into the existing launch volume or enable thinner films to be substituted with lower mass and equivalent tear resistance. A 2 mil thick Kapton film used for JWST can be replaced by a 0.3 mil ripstop reinforced CP-1 film and provide 2X improved tear resistance, but at only 15% of the 2 mil Kapton weight and volume. PSI is teamed with NeXolve Corporation to develop pilot scale (0.5 meter width) ripstop reinforcement equipment, basic Finite Element Models of the thermal, dynamic and structural influences of ripstop reinforcement, and confirm these models with fabricated and characterized reinforced CP-1 films. PSI will mature the ripstop technology so that it can be used to fabricate 5 meter sunshields during a Phase II program and provide a path to 16 m class or greater, lightweight, ambient or cryogenic flight-qualified observatory systems. PSI will fabricate a demonstration ripstop reinforced membrane on Phase I with direct scalability to a large sunshield flight system. We will show a path toward a Phase II delivery of demonstration sunshield hardware scalable to 5 meter diameter for ground test characterization. Commercialization efforts will be developed with our partner, NeXolve.



Rip-Stop Reinforced Thin Film
Sun Shield Structure, Phase I

Table of Contents

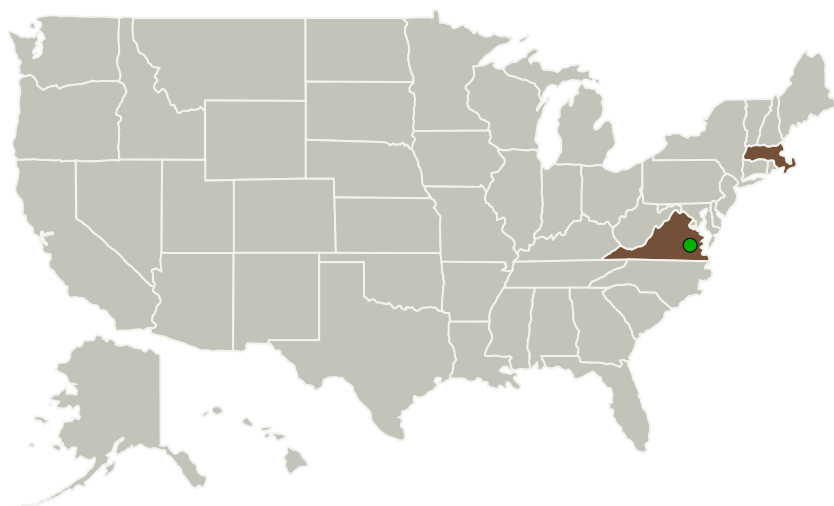
Project Introduction	1
Primary U.S. Work Locations and Key Partners	2
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

Rip-Stop Reinforced Thin Film Sun Shield Structure, Phase I

Completed Technology Project (2012 - 2012)



Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Physical Sciences, Inc.	Lead Organization	Industry	Andover, Massachusetts
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Massachusetts	Virginia

Project Transitions

▶ **February 2012:** Project Start

✓ **August 2012:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138464>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Physical Sciences, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

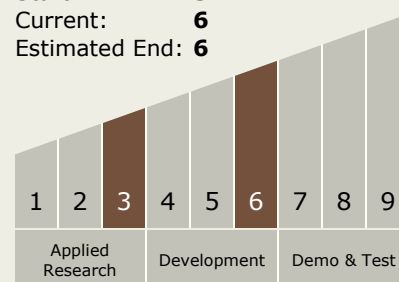
Carlos Torrez

Principal Investigator:

John Lennhoff

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



Rip-Stop Reinforced Thin Film Sun Shield Structure, Phase I

Completed Technology Project (2012 - 2012)



Technology Areas

Primary:

- TX07 Exploration Destination Systems
 - └ TX07.1 In-Situ Resource Utilization
 - └ TX07.1.3 Resource Processing for Production of Mission Consumables

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System